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REMOVAL AND SEPARATION OF SPILLED HAZARDOUS MATERIALS FROM IMPOUNDMENT BOTTOMS

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ABSTRACT

A demonstration was conducted of a system for removing spilled hazardous materials from pond bottoms and separating the hazardous materials and suspended solids from the resulting dredged slurry. The removal system consisted of a MUD CAT dredge, which can pump a discharge of approximately 1500 gallons per minute with a solids concentration of 10 to 30 percent. The processing system--in order of processing of material--consisted of a pair of elevated clarifier bins placed in series, a bank of six 4-inch diameter hydrocyclone cones, a conventional cartridge filter unit, and a newly developed Uni-Flow bag-type fabric filter.

Four different simulated hazardous materials were placed on the pond bottom, namely, very fine iron powder, fine glass beads, iron filings, and coal. These materials were then removed from the pond bottom by the MUD CAT dredge and pumped through the processing system. Tests were conducted to determine the efficiency of removal of these materials from the pond bottom by the dredge and also the efficiency of the processing system in removing these simulated hazardous materials from the dredged slurry. Using latex paint, a test was also conducted on the efficiency of the processing system in removing a real hazardous material from dredged slurry.

The MUD CAT dredge was very efficient in removing the simulated hazardous material from the pond bottom, averaging 99.3 percent removal for the four materials tested. Similarly, the overall processing system removed essentially all of the glass beads, iron filings, and coal, and 99.9 percent of the iron powder from the dredged slurry. During processing of the latex paint, 95.5 percent of the pigment was removed by the system.

After the field demonstration, evaluations and investigations were conducted on the tested apparatus, as well as on other equipment that could be used in a full 1500-gallons-per-minute portable processing system. A system consisting of a portable scalping-classifying tank combined with spiral classifiers, a Uni-Flow filter, and an inclined tube settler was conceptualized and preliminarily analyzed.

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SECTION I

INTRODUCTION

Practical methods for the removal and processing of hazardous or semihazardous materials from the bottoms of water bodies are receiving relatively high priority as targets for environmental action. Not only must the offending material be removed from the bottom sediments in an efficient and safe manner, but the removed sediment and hazardous material mixture must also be processed and disposed of in an environmentally acceptable and safe manner.

Consequently, Hittman Associates, Inc., under contract to the U.S. Environmental Protection Agency, conducted a demonstration of a system for the removal and processing of hazardous and semihazardous materials from the bottom of a shallow pond. Since it is difficult to justify the spilling of real hazardous materials into an aquatic environment even under research conditions, a number of simulated hazardous materials were spilled onto a pond bottom for the removal and processing demonstration. These simulated hazardous materials were relatively innocuous substances whose physical properties were chosen to represent a range of properties which might be displayed by real hazardous materials.

The purpose of the demonstration project was twofold. The first was to demonstrate a technique for removing hazardous materials from bottoms of water bodies at a high rate and yet have minimal adverse effects on the surrounding water body. The second purpose of the program was to evaluate a portable system which could be set up to process the sediment and hazardous materials mixture and return clean water to the pond.

The removal and processing systems used for this demonstration were the same as used on a previous EPA contract (Ref. 1) which demonstrated the dredging and processing of plain sediments. The removal system used was a MUD CAT dredge manufactured by National Car Rental System, Inc. It is specially designed for use on small bodies of water, and to impart minimum turbidity to the water while dredging. It can discharge approximately 1500 gallons per minute (gpm) of slurry with a solids concentration of 10 to 30 percent. Processing was performed by a system consisting of a pair of elevated settling bins, a bank of hydrocyclones, a standard cartridge-type water filter unit, and a bag-type filter known as a Uni-Flow filter. Basically, the Uni-Flow filter consists of a number of hanging hoses. Dirty water is pumped into the inside of the hoses and is allowed to filter through them. The suspended matter is trapped on the inside of the hoses. Periodically, the collected sludge is flushed from the inside of the hoses.

Each piece of equipment was evaluated as to its ability to remove the simulated hazardous materials along with the dredged solids. A conceptual design of a portable processing system was prepared based on the results of the field demonstration and additional manufacturer's literature.

This report constitutes the final report on the entire project. It includes the results of the field trials of the processing system, the evaluation of sediment processing equipment, and a conceptual design of a portable system for removing and processing hazardous materials from water bodies.

SECTION III

RECOMMENDATIONS

It is recommended that the MUD CAT dredge or its equivalent be utilized for the removal of particulate hazardous materials from water bodies when high flow rates and/or rapid removal is desired, since it produces a minimum resuspension of the dredged material into the surrounding water body.

Consideration should be given to the construction of a portable processing system similar to the conceptual system presented (consisting of a scapling-classifying tank combined with spiral classifiers, a Uni-Flow filter, and an inclined tube settler) if there is a continued projected need for a high-flow-rate hazardous materials processing system. Before finalization of design of such a system, field evaluations should be performed on the system components to ensure their working as projected at the full 1500-gallons-per-minute flow rate.